

CLAIMS:

1. A lithium-metal-oxide electrode compositions and structures having a layered crystallographic structure and the general formula $\text{Li}_x\text{Mn}_y\text{M}_{1-y}\text{O}_2$ where
5 $0 \leq x \leq 0.20$, $0 < y < 1$, manganese is in the 4+ oxidation state and M is one or more transition metal or other cations.
2. A material according to claim 1, wherein M is chosen from all of the other first row transition metals: Ti, V, Cr, Fe, Co, Ni and Cu, and other
10 cations with appropriate sized ionic radii: Al, Mg, Mo, W, Ta, Si, Sn, Zr, Be, Ca, Ga, and P, but is not solely Ni.
3. A material according to claim 1, wherein M is one or more transition metal or other cations chosen from the other first row transition metals: Ti, V,
15 Cr, Fe, Co, Ni and Cu, and other metal cations such as Al, Mo, W, Ta, Ga and Zr.
4. A material according to claim 1, wherein M is one or more transition metal or other metal cations chosen from the first row transition metals and
20 Al.
5. The use of a material according to any of the preceding claims, as positive electrode in a non-aqueous lithium cell or battery, such as a lithium ion cell.
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6. A process for making a material of formula $\text{Li}_x\text{Mn}_y\text{M}_{1-y}\text{O}_2$, wherein $x \leq 0.2$, $0 < y < 2$, Mn is Mn+4 and M is one or more transition metal cations or other cations, comprising providing a starting material of formula $\text{Li}_{1+x}\text{Mn}_y\text{M}_{1-y}$
30 O_2 , wherein x is equal to or greater than 0, and M is one or more transition metal or other cations, as a cathode in a lithium ion cell, and charging the cell to a high voltage.

7. A process according to claim 6, wherein M is chosen from all of the other first row transition metals: Ti, V, Cr, Fe, Co, Ni and Cu, and other cations with appropriate sized ionic radii: Al, Mg, Mo, W, Ta, Si, Sn, Zr, Be, Ca, Ga, and P, but is not solely Ni.
8. A process according to claim 6, wherein M is one or more transition metal or other metal cations chosen from the other first row transition metals: Ti, V, Cr, Fe, Co, Ni and Cu, and other cations such as Al, Mo, W, Ta, Ga and Zr.
9. A process according to claim 6, wherein M is one or more transition metal or other metal cations chosen from the first row transition metals and Al.
10. A process according to any of claims 6 to 9, wherein the voltage is in the range of 4.4 to 5 volts.